

ABOUT THE COURSE

The course named Electrical and Electronics Technology (EET) comes under engineering group. Electrical and Electronics Engineering field has radically transformed our way of life and so the basic concepts of the same have been dealt with in detail. Students with a flair for domestic appliance servicing and wiring will find the course a rewarding career option. Besides this, students can stabilize their career by equipping themselves with wire man licence. This can open the portals of self employment to the pass outs. For those aspiring to apply for government jobs, the course is recognised by PSC and so it opens job opportunities. There are ample opportunities in private sectors too. Due priority is also given to skill development to ensure that students don't take a back seat on their ride to success. So the future seems promising for EET students.

The course EET ensures a radical change at the academic level and so is all geared to set a new mile stone for its students. Our prime focus is on developing much needed man power in industries and opening up opportunities for self employment.

The much awaited syllabus revision has distanced the stagnancy that the course had been in for a long time. Bridging the gap between current industry requirement and skill competency of students is a herculean task. We believe that we have done justice to this issue and addressed it by taking a small step forward. All credit goes to replacing obsolete syllabus with portions incorporating current technology and industry requirement. This seems to be the only sensible solution. Practical skills of students should also be enhanced by paying more attention to hands-on-training.

JOB ROLES

A "job role" is a description of what a person does for a certain type of job. The job roles of the course in different sectors are given below:

GOVT/ SEMI GOVT SECTOR	PRIVATE SECTOR	SELF EMPLOYMENT
<ul style="list-style-type: none"> • Electrician • Wireman • Energy meter reader in KSEB • Lab Technical Assistant." 	<ul style="list-style-type: none"> • Electrician • Wireman • LED light repair Technician • Sales man(Electrical & Electronics goods) • Home Appliance Service technician • Solar equipments installation and service Technician. 	<ul style="list-style-type: none"> • Wireman • Home Appliance service technician • Electrician • Electronic circuit board assembling (soldering technician) • LED light repairing technician • LED Lamp assembling and selling. • Solar equipment installation and service Technician.

SUBJECT APPROACH

The way of life of our society has tremendously changed due to the drastic changes in the field of electrical and electronics engineering. The spectrum of this branch directs the prosperity of human being by a measure of per capita income earned through self or wage employment. Besides this, students can stabilize their career by equipping themselves with wireman licence. Also by obtaining 4 skill certificates after completion of this course, the learner will be able to start their own business ventures to become successful entrepreneurs with technical knowhow. This course deals with basic principles of electrical and electronics engineering, assembling and repairs of LED lamps, house wiring practice, home appliances servicing and solar equipment installation and maintenance. For those aspiring to apply for government jobs, this course is recognised by KPSC and so it opens job opportunities.

Objectives

- To prepare the learner to enter self employment as LED lamp repair technician, wireman, home appliance service technician and solar equipment installation and maintenance technician.

- To equip the learner to get wage employment in public as well as private sector by attaining skill and undertaking the service work.
- To meet the requirement of skilled man power as wireman/ technician in the field of electrical and electronics.
- To acquire basic knowledge in the field of electrical and electronics engineering at higher secondary level itself and thereby enabling him to equip with modern technology to get a foundation for his future studies/ career.

Learning approach

In the curriculum of EET, a learner centred and activity based approach is encouraged. The learning methods are selected in such a way that a specific learning outcome can be acquired. While thinking about the learning methods of vocational education, we must remember that this education is work-based. The 'learning by doing' approach can be used in most of the learning methods. But for getting resourcefulness (apply knowledge in different contexts), theoretical understanding is also necessary. Theory should not be isolated from practical activities as it happens in most of the vocational subjects. Since theory and practice happen in geographically different places, or at different times; sometimes the learner won't be able to see that these two relate together. So learning methods should balance theoretical and practical.

In activity based curriculum, most of the learning methods are progressing through group works. Learners work together for solving a problem. This improves the team spirit and creates a democratic atmosphere in class room/workshop/work place. It helps the cooperative and collaborative learning. The use of inquiry, discovery and problem solving approaches can be incorporated in teaching and learning process.

Unlike general subjects, the learning environment of vocational education is more complex. The Co-learners, Teacher/Trainer (experience, expertise and attitude) and the Physical location are the main factors for learning within a curriculum. Physical location is specifically important in vocational education, as most teaching takes place in the dual settings of both workplace and educational institution. The environment, particularly the outdoor natural environment, has much more to offer than just a 'location' for the delivery of experiential learning. The nature of work place is entirely different from the school work shop or from class room. In case of EET course, the possible learning environments such as workshops, servicing centres, wiring sites etc. can be made available as outdoor learning environment.

Vocational learning generally requires real hands-on experience. The use of e-learning is relevant to both the practical and the theoretical worlds in the sense that an increased use of e-learning can usually improve teaching and learning in both settings. The ICT possibilities in EET curriculum are using CDs of simulated experiments, work place videos, online resource sites, etc.

Vocational education is also suitable for most of the differently abled children. But, for each learner; there must have a scientific selection of vocational course depending on their disability and attitude. While selecting EET learners, safety measures of handling electricity must be given at most importance.

SCHEME OF WORK

Month	Unit	Period
June	Fundamentals of Electricity	40
	Electronics components and devices	28
July	Electronics components and devices	32
	Assembling and repair of LED Lamps	36
August	Assembling and repair of LED Lamps	68
September	Assembling and repair of LED Lamps	46
	Fundamentals of House wiring	22
October	Fundamentals of House wiring & House wiring practice	68
November	House wiring Practice	48
	Magnetism	20
December	House wiring Practice	48
	A C Circuits	20
January	House wiring Practice	38
	A C Circuits	30
February	House wiring Practice	36
	A C Circuits	10
	Transformers	22
March	House wiring Practice	30
	A C Circuits	30
	Transformers	8

SYLLABUS

Module: 1

Basic Electrical & Electronics Technology

Unit 1 - Fundamentals of Electricity (40 Hrs)

Resistance- Factors affecting resistance- Series and Parallel connections of Resistors- Conductors, Insulators - Properties- Concepts of Voltage & Current- Familiarisation of analog and digital meters- Connection of Ammeters and Voltmeters-Ohm's Law- KCL & KVL.

Unit 2 - Electronic Components and Devices - I (60 Hrs)

Passive components-resistors-colour coding of resistors-capacitors-Types of capacitors-Testing-Inductor-Types-Basics of semiconductor theory-Extrinsic semiconductor-doping-Intrinsic semiconductor-PN junction-Diode-biasing-VI characteristics, testing of diodes. -

Diode as a rectifier-centre tap and bridge rectifier-filter component and their role in reducing ripples.

Unit 3- Assembling and Repairing of LED Lamps (150 Hrs)

Soldering and De soldering techniques, tools/materials for soldering, soldering procedure, safety precautions in soldering. Soldering of electronic components in PCB

LED construction, working, applications and testing- advantages & disadvantages of LED Lamps. Assembling of LED lamps- Basic circuit-parts & working,

Fault finding and repair of LED lamps - Testing, identifying and rectifying component level faults-testing, identifying and rectifying LED strip level fault.

Unit 4 - House Wiring - I (90 Hrs)

Safety precautions- First aid practice- I.E rules related to house wiring- Kerala Cinema regulation rules-Tools and Accessories- Types of wires-Ratings -Voltage drops in cables- Wire joints- Types of house wiring-PVC Conduit, Casing and capping- Fuses- re-wireable & HRC, MCB, MCCB, ELCB- Earthing- Importance- Functional and Protective earthing-Size of earth electrodes- Pipe earthing and Plate earthing, Earth tester, Measurement of Earth resistance, Relays- Electrical contactor.

Module -2**House Wiring****Unit 1 - House Wiring - II****(200 Hrs)**

Lay out and circuit diagrams- Sub circuit calculation- Design of Distribution board (LDB and PDB) - Wiring Practice- Series, Parallel, Series-parallel- Stair case, Master control, Bell and buzzer-Hospital wiring- Megger, Testing of wiring installation, Wiring of special equipments-Inverter & UPS. Code of conduct and ethics of the wire man.

Estimation of a 2/3 bedroom house wiring as project work

Illumination- Lumen and Efficacy- Incandescent lamps- Fluorescent lamps- CFL lamps- Applications of Neon lamps, Halogen lamps, Sodium Vapour lamps.

Unit 2- Magnetism**(20 Hrs)**

Magnets- Types- Properties- Magnetic field, Magnetic flux, Flux density, Permeability- Classification of Magnetic materials- Faraday's Laws of Electromagnetic induction- Self induction- Mutual induction- Lenz's Law, Cork Screw rule, Right hand thumb rule, Eddy current and Hysteresis.

Unit 3 - AC Circuits**(90 Hrs)**

Electrical power generation-Types of generating stations - AC sine wave - Time period, Frequency, Amplitude, RMS Value, Average Value, Form factor, Peak factor- Phase- Phase difference- Types of loads- Resistive, Inductive and Capacitive- Impedance- Series circuits (RL, RC and RLC)- Power factor and its importance- Power factor improvement. kW, kVA, kVAR. - Power and Energy- Connection of Watt meter and Energy meter, Calculation of Energy Bill-.Methods for saving Electrical energy in domestic installations. Uses of Tong tester and Multi meter.

Three Phase Circuits- Star and Delta connections- Phase and Line values.

Unit 4 - Transformers**(30 Hrs)**

Transformer- Working principle- Construction- Core and Shell types- Transformation ratio- Parts of L.V and H.V transformers- Cooling- Rating, Losses and Efficiency- Auto transformer - Functions of substations.

LEARNING OUTCOMES

The learners will be able to:

MODULE 1. BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY

1.1. Fundamentals of Electricity

- 1.1.1. Carry out the different connections of resistors.
- 1.1.2. Explain the different factors affecting resistance.
- 1.1.3. Explain the properties of conductors and insulators.
- 1.1.4. Classify materials in to conductors, insulators.
- 1.1.5. Realise the concepts of Voltage & Current.
- 1.1.6. Connect Voltmeter & Ammeter (analog & digital) in a circuit.
- 1.1.7. State Ohm's Law, KCL, and KVL.

1.2 Electronic Components and Devices - I

- 1.2.1. Identify various passive components like resistors, capacitors & inductors used in electronic circuits.
- 1.2.2. Decode values of resistors from colour coding.
- 1.2.3. Test the various passive components.
- 1.2.4. Realise the concepts of doping, P&N type semiconductor.
- 1.2.5. Realise the concepts of formation of PN junction and diode.
- 1.2.6. Comprehend the methods of biasing a diode.
- 1.2.7. Plot V-I characteristics of diode.
- 1.2.8. Test diodes using multimeter.
- 1.2.9. Use diode as a centre- tapped rectifier.
- 1.2.10. Use diode as a bridge rectifier.
- 1.2.11. Realise the use of filter circuits and able to connect them in rectifier circuits.

1.3 Assembling and Repairing of L.E.D Lamps

- 1.3.1. State & explain Construction of LED.
- 1.3.2. Comprehend the working of LED.
- 1.3.3. Identify the advantages and disadvantages of LED.
- 1.3.4. Comprehend the methods of biasing LED.
- 1.3.5. Test LED using multimeter.
- 1.3.6. Solder & de- solder electronic components on circuit boards as per standard procedure.
- 1.3.7. State & explain safety precautions in soldering.
- 1.3.8. Test the circuit components of LED Lamps.
- 1.3.9. De-solder the faulty components.
- 1.3.10. Replace the faulty components.
- 1.3.11. Re-assemble LED Bulb.

1.4 House Wiring - I

- 1.4.1. State & explain safety precautions.
- 1.4.2. Comprehend IE rules related to house wiring.
- 1.4.3. Understand Kerala cinema regulation rules.
- 1.4.4. Apply first aid methods according to situation.
- 1.4.5. Identify tools and accessories.
- 1.4.6. Handle the tools safely and properly.
- 1.4.7. Identify different wires according to rating.
- 1.4.8. Perform wire joints.
- 1.4.9. Perform pipe Earthing as per standards

MODULE 2. HOUSE WIRING

2.1 House Wiring - II

- 2.1.1. Design and draw the layout & circuit diagram of an electrical installation.
- 2.1.2. Calculate the number of sub circuits according to the points & load.
- 2.1.3. Design distribution board of light and power circuit.
- 2.1.4. Draw circuit diagram, estimate and practice staircase wiring.
- 2.1.5. Draw circuit diagram, estimate and practice master control wiring.
- 2.1.6. Draw circuit diagram, estimate and practice bell and buzzer wiring.
- 2.1.7. Conduct various tests of wiring installation.
- 2.1.8. Wire up special equipments like Inverter and UPS.
- 2.1.9. Aware about the code of conduct and ethics in wiring.
- 2.1.10. Explain terms like-Luminous flux, Lumen, Luminous intensity and their units.
- 2.1.11. Identify the type, parts and working of incandescent lamp.
- 2.1.12. Explain the parts, construction and working of Fluorescent lamp.
- 2.1.13. Wire up fluorescent lamp circuit.
- 2.1.14. Familiarize the parts, construction and working of C F L.
- 2.1.15. Service fluorescent lamp circuit and CFL.
- 2.1.16. Explain the applications of Neon lamp and Sodium Vapour Lamp.

2.2. Magnetism

- 2.2.1. Comprehending the properties of magnet.
- 2.2.2. Define the terms of magnetism.

- 2.2.3. Classify magnetic substances.
- 2.2.4. State the laws and phenomenon of electromagnetic induction.
- 2.2.5. State the law to find the direction of magnetic field.

2.3 AC Circuits

- 2.3.1 Classify types of electrical power generating stations.
- 2.3.2 Comprehend various terms in A C circuits
- 2.3.3 Classify the types of loads in AC circuits
- 2.3.4 Comprehend power factor and its importance.
- 2.3.5 Explain on 3 phase circuit and the types of connections
- 2.3.6 Familiarise 3 phase circuits.
- 2.3.7 Realise the concepts of Power and Energy.
- 2.3.8 Calculate Power and Energy consumed in a circuit.
- 2.3.9 Calculate domestic energy consumption.
- 2.3.10 Explain various methods of electrical energy savings in domestic installations

2.4 Transformers

- 2.4.1 Identify core and shell types of transformers according to construction.
- 2.4.2 Relate current, voltage, power and number of turns in transformer.
- 2.4.3 Identity the parts of L.V and H.V transformers.
- 2.4.4 Comprehend the necessity of cooling in transformers
- 2.4.5 Comprehend various types and functions of substations

COURSE STRUCTURE

This course consists of 4 modules such as:-

Module 1:	Basic Electrical and Electronics Technology.	340 hrs
Module 2:	House Wiring.	340 hrs
Module 3:	Solar Equipment Installation and Maintenance.	340 hrs
Module 4:	Home Appliances Servicing.	340 hrs

CLASSROOM ACTIVITIES

- Group Discussions.
- Animated CDs.
- Demonstrations.

- General Discussions.
- Quiz.
- Chart preparation.
- Seminar.
- Project.
- Collection.
- Catalogue preparation.
- Brain storming
- Interaction with experts/successful entrepreneurs in the field.

PRACTICAL ACTIVITIES

- Practical works.
- Simulated experiments.
- Interaction with industrial experts.
- Exhibition.
- Collection.
- Model preparation.
- Circuit fabrication
- Industrial Visits.
- Survey.
- Case study.
- OJT

ON THE JOB TRAINING

OJT forms an integral part of vocational education. Skill education needs hands on experience and training in the real work environment. According to EET curriculum the learner must acquire skill in the field of LED lamp repairing, House wiring, Home appliance servicing and Installation & maintenance of solar equipments. For this course OJT can be conducted for 2weeks per year. It can be scheduled either one week after each module or 2 weeks together at the end of both the modules.

CERTIFICATION

Module 1	LED Light Repair Technician
Module 2	Wireman / Electrician
Module 3	Solar Equipment Installation and Maintenance Technician
Module 4	Electrical Home Appliance Service Technician

MODULE - 1**Basic Electrical and Electronics Technology****OVERVIEW**

The first module named Basic Electrical and Electronics Technology deals with the basics of electricity, identification and testing of electronic components, different soldering techniques and practice of assembling and repair of LED Lamp circuits, familiarisation of IE rules, wiring accessories, safety precautions, types of wiring and simple wiring circuits.

LIST OF EXPECTED SKILLS:

- Practicing connections of passive electronic components.
- Connection of Volt meter and Ammeter in a circuit
- Measurement of Voltage and Current.
- Decoding the value of carbon resistors.
- Testing of passive electronic components
- Fabrication of rectifiers.
- Assembling of LED lamps.
- Fault location in LED lamps.
- Repairing of faulty LED Lamps

STRUCTURE OF THE MODULE**Basic Electrical & Electronics Technology**

Unit No	Name of unit	Total Periods
1.1	Fundamentals of electricity	40
1.2	Electronic components and devices	60
1.3	Assembling and repairing of LED Lamps	150
1.4	House wiring-I	90
	TOTAL PERIODS 30% Periods - theory sessions and 70% periods - practical activities.	340

DETAILED ELEMENTS OF UNIT

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Fundamentals of electricity (40 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Resistance, connections and factors affecting resistance. Skills: Identifying Comparison skill. Observation skill. Skills of connecting resistors. Properties of Conductors and Insulators Skills: Observing. Classifying. Analysing. Voltage, Current, Voltmeter and Ammeter (analog and digital). Skills: Handling Connecting. Ohm's Law, KCL & KVL. Skills: Observing. Measuring and charting. Experimenting. 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Carry out the different connections of resistors. Explains the different factors affecting resistance. Explains the properties of conductors and insulators. Classify materials in to conductors, insulators. Realise the concepts of Voltage & Current. Connect Voltmeter. Connect Ammeter. Experiment: <ol style="list-style-type: none"> Ohm's Law. KCL KVL Formulate Ohm's law. Understand KCL and KVL. 	<ul style="list-style-type: none"> General discussion on resistance and factors affecting resistance. Demonstration of resistors connected in parallel and series Practical work of series and parallel connections Collection of conductors and insulators. Group discussion- properties of conductors and insulators. General discussion Simple experiment-Connections of Voltmeter and Ammeter Experiment Group Discussion. General Discussion 	<ul style="list-style-type: none"> Notes in the activity log, Skill of connecting resistances, Active participation in groups and collection Active participation in discussion and experimentation Notes in activity log, Skill of experimentation.

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Electronic components and devices (60 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Resistors-colour coding of resistors. Skills: Identifying Comparison skill. Observation skill. Skills of calculating Values of resistors. Capacitors-Types-Testing Skills: Observing. Classifying. Analysing. Testing of capacitor. Inductor-Types. Skills: Observing. Comparing. Basics of semiconductor theory- Extrinsic semiconductor-doping- Intrinsic semiconductor Skills: Observing. Classifying. Analysing. PN junction-Diode, Skills: Observing. 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Identify different types of resistors. Calculate the values of carbon resistors. Identify different types of capacitors. Test the Capacitor. Realise the concepts of Inductors and its various types. Realise the concepts of Semiconductor theory. Extrinsic semiconductor. Intrinsic semiconductor Realise the concepts of PN junction Diode. 	<ul style="list-style-type: none"> Demonstration of different types of resistors. Practical work of calculating values of carbon resistors using colour coding. Demonstration of different types of capacitors. Practical work of testing of capacitors. General discussion with demonstration of inductors. General discussion using ICT. General Discussion using ICT. 	<ul style="list-style-type: none"> Notes in the activity log, Skill of colour decoding of carbon resistors. Capacitor testing skill. Notes in Practical activity log. Notes in activity log, Participation in discussion Notes in Practical activity log

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Electronic components and devices (60 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> • Biasing of Diodes-VI characteristics Skills: Connecting and recording. Collecting and recording. Plotting. Problem solving. • Diode as a rectifier-centre tap rectifier. Skills: Observing. Connecting. • Diode as a rectifier- bridge rectifier. Skills: Practical Measuring • Filter component and their role in reducing ripples. Skills: Practical Analyzing 	<ul style="list-style-type: none"> • Connect the diodes in forward and reverse bias conditions. • Explain the process in the diode while biasing. • Analyse the VI Characteristics of Diode. • Test diodes using multimeter • Realize packing types of diodes. • Use diode as a rectifier • Realise the use of filter circuits and their role in reducing ripples. • Connect filter circuits to rectifier circuits. 	<ul style="list-style-type: none"> • Group Discussion. • Chart display. • Practical work. • General discussion • Demonstration • Practical work. • General discussion • Practical work • General discussion using ICT. • Practical work 	<ul style="list-style-type: none"> • Notes in activity log, Involvement in practical work. • Involvement in practical work. • Notes in activity log, • Notes in activity log, Involvement in practical work

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Assembling and repairing of LED Lamps (150 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Soldering techniques Types Materials and tools required Soldering procedure Skills: Soldering or electronic components Handling of tools De Soldering techniques Materials and tools required De Soldering procedure Skills: De Soldering of components from circuit boards Handling of tools Safety precautions in soldering Skills: Observing Explaining Light Emitting Diode (LED) Construction, Working, Application, Advantages & disadvantages Skills: Identifying. Comparing. Testing and biasing of LED Skills: Handling Observing Testing. 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Solder electronic components on circuit boards with skill. De Solder electronic components on circuit boards with skill State & explain safety precautions. Learner is able to: <ul style="list-style-type: none"> State & explain Construction of LED Comprehend the working of LED Identify the advantages and disadvantages of LED Comprehend the methods of biasing LED Test LED using multimeter. 	<ul style="list-style-type: none"> Demonstration Discussion Practical work Demonstration Discussion Practical work Group Discussion using ICT Group Discussion using ICT Chart display and discussion after brain storming. Practical work. 	<ul style="list-style-type: none"> Soldering skill Practical activity log De Soldering skill Practical activity log Involvement in group discussion. Activity log Involvement in Group discussion. Activity log and participation in discussion Practical activity log and involvement in practical activity.

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Assembling and repairing of LED Lamps (150 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Assembling of LED lamps Basic circuit, parts & working of LED lamps. Skills: <ul style="list-style-type: none"> Observing Soldering Assembling Fault finding and repair of LED lamps-Identifying & rectifying component level faults Skills: <ul style="list-style-type: none"> Dismantling Observing Identifying fault De soldering Rectifying fault Re assembling Fault finding and repair of LED lamps- Identifying & rectifying LED strip level faults Skills: <ul style="list-style-type: none"> Dismantling Observing Identifying fault Rectifying fault Re assembling 	<ul style="list-style-type: none"> Assemble LED Lamps individually Dismantle LED lamp Test the circuit components De solder the faulty components Replace the faulty components. Re assemble LED lamp. Dismantle LED lamp. Test the circuit Strip Rectify the fault Re assemble LED lamp. 	<ul style="list-style-type: none"> Practical work Practical activity Practical Activity 	<ul style="list-style-type: none"> Involvement /participation in the practical work Practical activity log Involvement /participation in the practical work Practical activity log Involvement /participation in the practical work Practical activity log

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY

Unit : House wiring-I (90 periods)

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Occupational safety and health Safety precautions to be observed in house wiring ; I E rules, Kerala cinema regulation rule , First aid practice. Skills: Observing Explaining 	<ul style="list-style-type: none"> Leaner is able to: State & explain safety precautions, Comprehend IE rules related to house wiring Understand Kerala cinema regulation rules. Apply first aid methods according to situation 	<ul style="list-style-type: none"> Group Discussion using ICT Chart display for familiarising rules &precautions , 	<ul style="list-style-type: none"> Involvement in G D Activity log
<ul style="list-style-type: none"> Identification of wiring accessories, hand tools and specification Skills: Handling Observing Identification Classification 	<ul style="list-style-type: none"> Identify tools and accessories. Handle the tools safely and properly. 	<ul style="list-style-type: none"> Demonstration of hand tools Practice in using hand tools Sketching of tools as assignment Fixing of wiring accessories using proper hand tools 	<ul style="list-style-type: none"> Skill in handling different tools Practical activity log Assignment in the activity log
<ul style="list-style-type: none"> Identification and rating of wires. Voltage drops in wires Skills: Observing. Identifying. Classifying. Inferring. 	<ul style="list-style-type: none"> Identify different wires according to rating 	<ul style="list-style-type: none"> Collection Demonstration Classification Discussion Chart preparation 	<ul style="list-style-type: none"> Involvement in collection and classification Discussion Activity log Chart
<ul style="list-style-type: none"> Practice different wire joint techniques Skills: Wire joining techniques. 	<ul style="list-style-type: none"> Perform wire joints 	<ul style="list-style-type: none"> Removing of insulation from wires and cables Demonstration. Practice of single & multi stranded conductors 	<ul style="list-style-type: none"> Involvement in practical work Practical activity log

Unit : House wiring-I (90 periods)

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Familiarizing different types of wiring systems, PVC Conduits - surface and concealed - PVC casing and capping. IE rules regarding clip Distance-fixing of screws, cable bending etc Skills: Classifying. Tools handling. Fixing of conduit and casing & capping. Identification of protective devices Fuse - kit-kat, HRC M C B, M C C B E L C B Skills: Observing Classifying Identifying Earthing- Importance of earthing Improving earth resistance Pipe and plate earthing functional and protective earthing. Skills: Connecting Observing Measuring Experimenting 	<ul style="list-style-type: none"> Distinguish between the two systems of wiring. Fix screws and cable bending Identify different types of fuses and circuit breakers. Connect Fuses/MCBs with ELOB/RCCB Identify the pipe earthing and plate earthing. Practice Pipe Earthing. Measuring earth resistance 	<ul style="list-style-type: none"> Demonstration Lay out on wiring boards Practice PVC insulated surface conduit wiring and casing capping wiring on wooden board Demonstration Discussion Sketching Chart preparation Chart display Discussion Sketching Practical work (Familiarise the materials used now a days instead of salt & charcoal, G I Pipe etc. through GD.) 	<ul style="list-style-type: none"> Skill in handling tools Involvement in practical work Practical activity log Identifying and connecting. Involvement in practical work Practical activity log

LIST OF PRACTICAL ACTIVITIES

- Measurement of Voltage and Current.
- Verification of Ohm's law.
- Testing of electronic components-resistors,capacitors,LED,diode
- V-I Characteristics of diode
- Fabrication of full wave bridge rectifier (with and without filter).
- Fabrication of full wave centre tapped rectifier (with and without filter).
- Soldering and de soldering of electronic components.
- Assembling of LED lamps.
- Fault finding and repairing of LED lamps.
- Identification and rectification of LED strip level faults.
- Project works related to LED assembling.
- Electrical Signs and Symbols.
- Identification of hand tools with specifications.
- Familiarisation of wiring accessories.
- Identification of types of cables for different current ratings.
- Practice wire joints— such as Britannia, straight, Tee, Western union Joints.
- Practice crimping thimbles/lugs of various sizes.
- Practice connections and testing of MCBs and ELCB/RCCB.
- Practice pipe earthing and measure earth resistance.
- Practice connections of relays and electrical contactors.

MODULE - 2**House Wiring****OVERVIEW**

House wiring circuits, illumination details, design of L.D.B & P.D.B, Circuit diagrams and wiring practices with more practical time are included in this module so that the learner may become confident enough to undertake house wiring by himself/herself. This module also intends to issue a skill certificate in 'Electrical Wireman'. After successfully completing EET course, the learners will be able to apply for wireman license test conducted by Electrical Inspectorate. Basic idea of magnetism, electrical power generation, Electrical energy bill calculation and fundamental of AC Circuits are also included in this module.

LIST OF EXPECTED SKILLS:

- Practice House wiring.
- Wiring installation testing.
- Installation and Servicing of Fluorescent Lamp circuit.
- Connection of watt meters and Energy meters
- Design and wire up a Light Distribution Board (LDB) wiring.
- Design and wire up a Power Distribution Board (PDB) wiring.
- Prepare Estimation of a 2/3 bedroom house.

STRUCTURE OF THE MODULE**HOUSE WIRING**

Periods: 340

Unit No.	Name of units	Periods
2.1	House Wiring - II	200
2.2	Magnetism	20
2.3	A.C. Circuits	90
2.3	Transformers	30
	TOTAL PERIODS	340
	30% Periods - theory sessions and 70% periods - practical activities.	

Module 2 : House Wiring **Unit : House Wiring - II (200 periods)**

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Layout & circuit diagram of an electrical installation. Skills: Classifying, Observing, Sketching. Sub circuit calculation Skills: Classifying, Observing, Familiarizing, Calculation. Design and practice of distribution board LDB & PDB Skills: Demonstrating, Observing, Sketching Connection and testing of Series (surface conduit system) Skills: Handling tools and instrument. Wiring. Connection and testing of Parallel (surface conduit system) Skills: Handling tools and instrument. Wiring. 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Design and draw the layout & circuit diagram of an electrical installation. Calculate the number of sub circuits according to the points. Design distribution board of light and power circuit. Design distribution board of light and power circuit. Practice distribution board wiring. Wire up series wiring circuit in PVC surface conduit system. Wire up parallel wiring circuit in PVC surface conduit system. 	<ul style="list-style-type: none"> Chart display Sketching Demonstration using ICT Demonstration Calculation Discussion Demonstration Group discussion Practical work. Drawing lay out, Selecting wiring accessories, Practice on work board and testing of the wiring. Drawing lay out, Selecting wiring accessories, Practice on work board and testing of the wiring. 	<ul style="list-style-type: none"> Circuit diagram preparing skills. Activity log Involvement in group discussion Activity log Involvement in group discussion Activity log & Practical activity log Involvement in practical work. Practical activity log. Involvement in practical work. Practical activity log

Module 2 : House Wiring		Unit : House Wiring - II (200 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> • Connection and testing of Series parallel circuits. (surface conduit system) Skills: Handling tools and instrument. Wiring. • Bell and buzzer Wiring. Skills : Observing. Sketching. Wiring. • Testing of electrical installation. Skills : Observing. Identifying. Installation testing skills • Wiring of Inverter & UPS Skills : Sketching. Identifying. Wiring and Connecting. • Code of conduct and ethics by the wireman Skills : Analysing classifying 	<ul style="list-style-type: none"> • Wire up series-parallel wiring circuit in PVC surface conduit system. • Draw lay out, circuit diagram, estimate and practice Bell and buzzer wiring. • Conduct various tests of wiring installation. • Wire up special equipments like Inverter and UPS • Aware about the code of conduct and ethics in wiring. 	<ul style="list-style-type: none"> • Drawing lay out, Selecting wiring accessories, Practice on work board and testing of the wiring. • Demonstration Group discussion. Practical work • Demonstration. Discussion. Practical work. • Sketching Demonstration Discussion Practical work • General discussion 	<ul style="list-style-type: none"> • Involvement in practical work. Practical activity log • Involvement in group discussion Activity log & Practical activity log. • Involvement in Discussion Practical activity log. • Involvement in discussion. Practical Activity log. • Involvement in discussion Activity log

Module 2 : House Wiring **Unit : House Wiring - II (200 periods)**

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> • Illumination- Terms- Luminous flux Lumen Luminous intensity And their units Skills : identifying Classifying Observing. 	<ul style="list-style-type: none"> • Explain terms like - Luminous flux Lumen Luminous intensity and their units. 	<ul style="list-style-type: none"> •• Group discussion. Demonstration using CT Chart preparation 	<ul style="list-style-type: none"> • Involvement in group discussion chartpreparation Activity log
<ul style="list-style-type: none"> • Incandescent lamp- Construction and working Skills: Identifying Classifying Observing. 	<ul style="list-style-type: none"> • Identify the parts and working of incandescent lamp 	<ul style="list-style-type: none"> • Demonstration. Discussion. 	<ul style="list-style-type: none"> • Involvement in group discussion. Activity log
<ul style="list-style-type: none"> • Fluorescent lamp- Construction and working. Electrical circuit diagram and wiring. Skills : Identifying Observing Testing. Connecting. 	<ul style="list-style-type: none"> • Explain the parts, construction and working of Fluorescent lamp. Wire up fluorescent lamp circuit. 	<ul style="list-style-type: none"> • Demonstration. Practical work. 	<ul style="list-style-type: none"> • Involvement in practical work. Practical activity log
<ul style="list-style-type: none"> • C F L Parts, Construction and working Skills: identifying Observing. Connecting. 	<ul style="list-style-type: none"> • Familiarizing the parts , construction and working of CFL 	<ul style="list-style-type: none"> • Demonstration. Practical work. 	<ul style="list-style-type: none"> • Involvement in practical work. Practical activity log.
<ul style="list-style-type: none"> • Trouble shooting of Fluorescent lamp circuit and CFL Skills Analysing. Trouble shooting. 	<ul style="list-style-type: none"> • Service fluorescent lamp circuit and CFL. 	<ul style="list-style-type: none"> • Testing. Practical work. 	<ul style="list-style-type: none"> • Involvement in practical work. Practical activity log.
<ul style="list-style-type: none"> • Applications of Neon lamp and Sodium Vapour Lamp Skills: Identifying Observing. 	<ul style="list-style-type: none"> • Explain the applications of Neon lamp and Sodium Vapour Lamp. 	<ul style="list-style-type: none"> • Demonstration. Discussion. 	<ul style="list-style-type: none"> • Involvement in discussion Activity log

Unit : Magnetism (20 periods)

Module 2 : House Wiring

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Properties of magnet Skills: observing Identifying Terms associated with magnetism Magnetic field Magnetic flux Flux density Permeability Paramagnetic , diamagnetic Ferromagnetic Skills: Identifying Classifying Familiarizing 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Comprehend the properties of magnet define the terms of magnetism classify magnetic substances 	<ul style="list-style-type: none"> demonstration brain storming discussion demonstration brain storming discussion classification collection 	<ul style="list-style-type: none"> Involvement in discussion Activity log Involvement in discussion collection Activity log
<ul style="list-style-type: none"> Faraday's laws of electromagnetic induction Self induction Mutual induction Skills: familiarizing Identifying 	<ul style="list-style-type: none"> State the laws and phenomenon of electromagnetic induction 	<ul style="list-style-type: none"> demonstration discussion I C T collection 	<ul style="list-style-type: none"> Involvement in discussion Activity log
<ul style="list-style-type: none"> Laws used to find the direction of magnetic field Cork screw rule Right hand thumb rule Skills: familiarizing Identifying Observing 	<ul style="list-style-type: none"> State the law to find the direction of magnetic field 	<ul style="list-style-type: none"> I C T Demonstration Discussion 	<ul style="list-style-type: none"> Involvement in discussion Activity log

Module 2 : House Wiring		Unit : A.C. Circuits (90 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Electrical power generation-types Substations-functions and types Distribution -types Skills: familiarizing Classifying Analyzing A C circuits A C sine wave ,time period , frequency, R M S value, average value , form factor , peak factor, maximum value, phase , phase difference Skills: familiarizing Classifying Analyzing Observing Sketching Types of load Resistance, Inductance, Capacitance AC through RL,RC,RLC series circuit Power factor and its importance Three phase circuits Star and delta connections Phase and line values Skills: Connecting Sketching Familiarising 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Comprehend various types and functions of sub stations. Classify different types of distribution system Define the various terms in A C circuits Comprehending on time period frequency, R M S value, average value , form factor , peak factor, maximum value, phase , phase difference Classify the types of load Familiarising various series circuit General discussion on power factor and its importance Discuss 3 phase circuit and its classification Familiarise 3 phase circuits Solve Simple problems 	<ul style="list-style-type: none"> I C T Group Discussion. Classification Chart preparation I C T Group Discussion. Classification Chart preparation Classification Demonstration Discussion Chart preparation Demonstration Discussion Sketching Chart Preparation Problem solving 	<ul style="list-style-type: none"> Involvement in discussion Activity log Involvement in discussion Activity log Involvement in discussion Activity log Involvement in discussion Activity log

Module 2 : House Wiring				Unit : A.C. Circuits (90 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment		
<ul style="list-style-type: none"> Power, Energy, Connection of Wattmeter, Energy meter Skills: Observing, Experimenting, Handling Connecting, Problem solving. Energy calculation and Energy saving methods. Skills: Connecting and recording, Problem solving. 	<ul style="list-style-type: none"> Realise the concepts of Power and Energy. Calculate Power and Energy consumed in a circuit. Calculate domestic energy consumption. Explain various methods of electrical energy savings. 	<ul style="list-style-type: none"> Group Discussion. Measurement of Power by V-I and wattmeter methods. Connection of Energy meter and Calculation of error. General Discussion on Power of different loads. Energy calculation. Field survey on energy savings methods. 	<ul style="list-style-type: none"> Skill of Connection. Notes in Practical activity log. Activity log book. 		

Module 2 : House Wiring				Unit : Transformers (40 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment		
<ul style="list-style-type: none"> Transformer- Principle of working Construction, types Rating Transformation ratio Skills: Classifying Identifying Problem solving. Parts and Protective devices of 3 Phase transformers. Skills: Identifying , Losses in transformers Cooling of transformers Necessity Skills: Identifying Classifying 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Identify the different types of transformers according to construction Relate current, voltage, power and number of turns in transformer. Identify the parts of LV and HV transformers Comprehend the necessity of cooling 	<ul style="list-style-type: none"> Discussion Chart Simple problem solving Demonstration Sketching Activity log Chart display Discussion I C T Field visit Chart display Discussion 	<ul style="list-style-type: none"> Involvement in discussion and problem solving Activity log Involvement in discussion and field visit Field visit report Activity log Involvement in discussion Activity log 		

LIST OF PRACTICAL ACTIVITIES

- Layout, circuit diagrams and estimation of parallel, series and series-parallel circuits.
- Estimate and wire up a circuit to control one lamp by one switch.
- Estimate and wire up a circuit to control two lamps in series by one switch.
- Estimate and wire up a circuit to control two lamps independently.
- Estimate and wire up a circuit to control two lamps through two SPST switches to burn dim or one lamp bright.
- Estimate and wire up a circuit to control two lamps through one SPDT switches to burn dim or one lamp bright.
- Estimate and wire up a circuit to control one lamp from two different places.
- Estimate and wire up a circuit for a calling bell and a buzzer.
- Estimate and wire up a master control wiring.
- Estimate and wire up a power plug socket wiring.
- Estimate and wire up a series parallel test board wiring.
- Design and wire up a Light Distribution Board (LDB) wiring.
- Design and wire up a Power Distribution Board (PDB) wiring.
- Assemble and install a fluorescent lamp.
- Familiarisation of star and delta connections.
- Measurement of Power and Power factor.
- Testing for error in single phase Energy meter.
- Estimation of a 2/3 bedroom house wiring as project work

DETAILED UNIT ANALYSIS

Module I BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY

Unit 1.1 Fundamentals of Electricity

The first unit fundamentals of electricity comprises of the basics of electricity which enable the learners to reinforce the ideas regarding different circuit connections of resistors and laws related to electric circuits. This unit also aims to familiarise the learners regarding the calculation of electricity bill.

DETAILED ELEMENTS OF UNIT

Module 1 : BASIC ELECTRICAL & ELECTRONICS TECHNOLOGY		Unit : Fundamentals of electricity (40 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> Resistance, connections and factors affecting resistance. Skills: Identifying Comparison skill. Observation skill. Skills of connecting resistors. Properties of Conductors and Insulators Skills: Observing. Classifying. Analysing. Voltage, Current, Voltmeter and Ammeter (analog and digital). Skills: Handling Connecting. Ohm's Law, KCL & KVL. Skills: Observing. Measuring and charting. Experimenting. 	<p>The learner will be able to:</p> <ul style="list-style-type: none"> Carry out the different connections of resistors. Explains the different factors affecting resistance. Explains the properties of conductors and insulators. Classify materials in to conductors, insulators. Realise the concepts of Voltage & Current. Connect Voltmeter. Connect Ammeter. Experiment: <ol style="list-style-type: none"> Ohm's Law. KCL KVL Formulate Ohm's law. Understand KCL and KVL. 	<ul style="list-style-type: none"> General discussion on resistance and factors affecting resistance. Demonstration of resistors connected in parallel and series Practical work of series and parallel connections Collection of conductors and insulators. Group discussion- properties of conductors and insulators. General discussion Simple experiment-Connections of Voltmeter and Ammeter Experiment Group Discussion General Discussion 	<ul style="list-style-type: none"> Notes in the activity log, Skill of connecting resistances, Active participation in groups and collection Active participation in discussion and experimentation Notes in activity log, Skill of experimentation.

Content: Resistance, connections and factors affecting resistance

Suggested activity 1.1.1: Demonstration, Practical work

Demonstration by the teacher

Take resistance wires of different lengths and thickness. Measure their resistances by ohmmeter. Compare the values and discuss.

Take two rheostats/lamp loads. Measure their resistances using ohmmeter. Connect them in series and Parallel. Measure the combined resistances.

Discussion Points:

- Resistance.
- Factors affecting resistance.
- Series and Parallel connections.
- Effective resistances in both cases.
- Equations ($R=R_1+R_2$. $1/R=1/R_1+1/R_2$).
- Resistivity.
- Problems related to series, parallel and series-parallel connections.

Practical work by the students:

Each learner should do the series and parallel connections.

Content: Properties of Conductors and Insulators.

Suggested activity 1.1.2: Collection, Group Discussion.

Group the learners. Collect different materials such as copper, aluminium, iron, wood, plastic, rubber, etc. Classify them as conductors and Insulators.

Conduct group discussions:

- Resistivity and Conductivity.
- Effect of temperature.

Content: Voltage, Current, Voltmeter and Ammeter.

Suggested activity 1.1.3: General Discussion, Simple Experiment.

- Potential.
- Potential difference.
- Flow of electrons.
- Voltage & Current.
- Connections of Voltmeter, Ammeter (digital and analog).

Simple Experiment:

Connect of Ammeter and Voltmeter (digital and analog) to supply with a lamp load.

Measure the current and voltage.

Content: Ohm's Law, KCL & KVL.**Suggested activity 1.1.4: Experiment.**

Connect volt meter and ammeter to a lamp load.

Change the supply.

Note down the readings and verify Ohm's law.

Connect the Lamp loads in a closed circuit with voltmeters in parallel with each load.

Connect the circuits to supply with voltmeters and ammeters.

Verify KCL and KVL.

Sample TE questions

- 'Ammeter is a low resistance meter'-substantiate the statement.
- Two resistances of $100\ \Omega$ and $150\ \Omega$ are given to you. Connect these resistors in such a way that the total resistance will be less than $100\ \Omega$. Also find the total value of the combination.
- State the law which is used to find the direction and magnitude of current flowing through the junction in an electric circuit.

LIST OF TOOLS AND EQUIPMENTS

Sl No	Item Description	Specifications	Quantity
1	Steel Rule	300mm	25
2	Screw Driver	200mm	25
3	Screw Driver	100mm	25
4	Terminal Screw Driver	75mm (connector)	25
5	Electricians Knife	Db	25
6	Ball Peen Hammer	0.25kg	25
7	Combination Pliers- Insulated	200mm	25
8	Neon Tester	500 Volt	25
9	Trisquare	200mm	5
10	Small Crimping Tools (Assorted)	10 - 100 Mm	5
11	Spanner Set De	Set Of 6 From 6x7 To 16x7	10
12	Screw Driver Set(Set Of 5)	100 - 300 Mm	25
13	File Half Round Second Cut	250 Mm	10
14	File Round Second Cut	150 Mm	10
15	File Flat	300 Mm Rough	5
16	Hack Saw		10
17	Wiring Board	3mx1m	25
18	Hand Drilling Machine With Drill Bits	Assorted Bits	1
19	Power Drill	12 Mm, Capacity 250v	1
20	Side Cutting Plier Insulated	200 Mm	10
21	Flat Nose Plier Insulated	150 Mm	10
22	Round Nose Plier Insulated	200 Mm	10
23	Long Nose Plier Insulated	200 Mm	10
24	Screw Driver Heavy Duty	200 Mm & 300 Mm	30 Each
25	Firmer Chisel	1 Inch & ½ Inch	5 Each
26	Wire Stripper	150 Mm	10
27	Cross Peen Hammer	0.50 Kg	10
28	Rawal Tool Holder &Bit	No 8,10,14 &16	1 Set
29	Poker With Insulated Handle		10
30	Allen Key	Set 5-11	1 Set
31	Bench Vice	150 Mm	1
32	Rubber Gloves	5000 Volts	2 Pair
33	All Types Cfl Lamp Sets	5w,15w,25w	5 Each
34	Dc Regulated Power Supply	0-30 V	2

35	Multi Meter (Analog & Digital)	0-5,100,200, 500 Ma 0-100,1000, 10000 Ohms 0-150,300, 600 Volts Ac/Dc	5 Each
36	Ammeter Ac/Dc (Analog & Digital)	0-5 A , 0-10 A , 0-15a	5 Each
37	Ammeter Dc (Analog & Digital)	0-500ma , 0-1 A , 0-5a	5 Each
38	Megger (Insulation Tester)	500volts	2
39	Voltmeter(dc) Analog	0-1 V,0-3 V, 0- 5 V, 0-30 V	5 Each
40	Voltmeter(dc) Digital	0-1 V,0-3 V, 0- 5 V, 0-30 V	5 Each
41	Earth Tester	500v	2
42	Watt Meter	250v & 500v, 5a, 10a Unity Pf	2 Each
43	Energy Meter Digital	Single Phase,10 A	2
44	Energy Meter Digital	Three Phase,10 A	2
45	Tong Tester	500 V,100a	1
46	Magnifying Lens		5
47	First Aid Kit		1

Wiring Accessories

SI No	Item Description	Specifications	Quantity
1	PVC Conduit	13 Mm	15
2	PVC Conduit	20 Mm	10
3	PVC L-bow ,Bend,Y, 3-way,T,4-way	13 Mm	25 Each
4	PVC L-bow ,Bend, Y,3-way,T,4-way	20 Mm	25 Each
5	1mm ² Pvc Insulated Copper Wire	650 Volts	3 Coils
6	2.5mm ² Pvc Insulated Copper Wire	650 Volts	1 Coil
7	Earth Wire	18 Swg Copper	1 Coil
8	ICDP	16 A,240 V	2
9	ICTP	32 A,415 Volts	2
10	Kit Kat Fuse Unit	5 A, 240 V	15
11	Neutral Link	5 A,250 V	5
12	Isolator	Single Phase, 2 Pole, 20a,240 V	2

13	MCB	6a/10a,240 V	10
14	ELCB	240 V Leakage Current 32 Ma	1
15	Batton Holder	5 A 240 V	20
16	Ceiling Rose	5 A 240 V	10
17	Tube Light With Frame	5 A,240 V	5

Electronics

Sl. No	Item Description	Specifications	Quantity
1	Pn Junction Diodes	In 4001, In4007, Led (White)	10 Dozen Each
2	Transformer	230/6v,6-0-6/12v/12-0-12v	5 Nos Each
3	Capacitors	100µf/25v, 1000µf/25v,10µf/160v 1 µf/400v,0.22 µf/400v (Polyester)	5 Dozen Each 5 Dozen Each
4	Resistors	Different Values, 0.25w	10 Dozen Each
5	Resistors	Different Values, 0.5w	5 Dozen Each
6	De Soldering Pump		5
7	LED Lamp kit (5 w)		25
8	Power Analyser		2
9	Soldering Iron Changeable Bits	30/50w-230v	25
10	Bread Board		10
11	General PCB		20
12	Soldering Lead		5 Coils
13	Soldering Flux	50g Pack	5
14	Single Strand Connecting Wire		50 M
15	Soldering Station		
16	Light Emitting Diodes	Bright White	25 Dozens
17	LED Strip		25 Nos

REFERENCES BOOKS

- K.B. Bhatia (2014) Study of Electrical appliance and Devices. Khanna Publishers , New Delhi.
- G.K. Mithal (2006) Text book of Electrical Engineering. G.K.Publications
- B.L. Thereja,A.K.Theraja- Electrical Technology Vol.1 and 2, (2013), S chand publications.
- K.B. Raina.,S.K.Bhattacharya (2015) Electrical design estimating and costing, New age international Ltd. Publications.
- Dr. S.L Uppal., G.C Garg (6th Edition) Electrical wiring estimating and costing, Khanna Publishers , New Delhi.
- P V Gupta,(2013), Introductory course in electromagnetic field, Dhanpat Rai Publications
- M.L. Anwani, Basic Electrical Engineering,(3rd Edition), Dhanpat Rai Publications.
- V. K. Mehta,Rohith Mehta(2014) Principles of Electronics, S Chand Publications
- Harish C Roy,(2013) Power Electronics, Umesh Publications
- Achuth Sankar S Nair & K.Madanan (2006) Electronics- Basic Principles, State of language,Kerala
- N N Bhargava, D C Kulshreshta, S C Gupta(2006) Basic Electronics & Linear circuits, Tata Mc Graw hill Publications
- N Alagappan, S Ekambaram (1999) , Electrical Estimating and Costing, Tata Mc Graw hill Publications